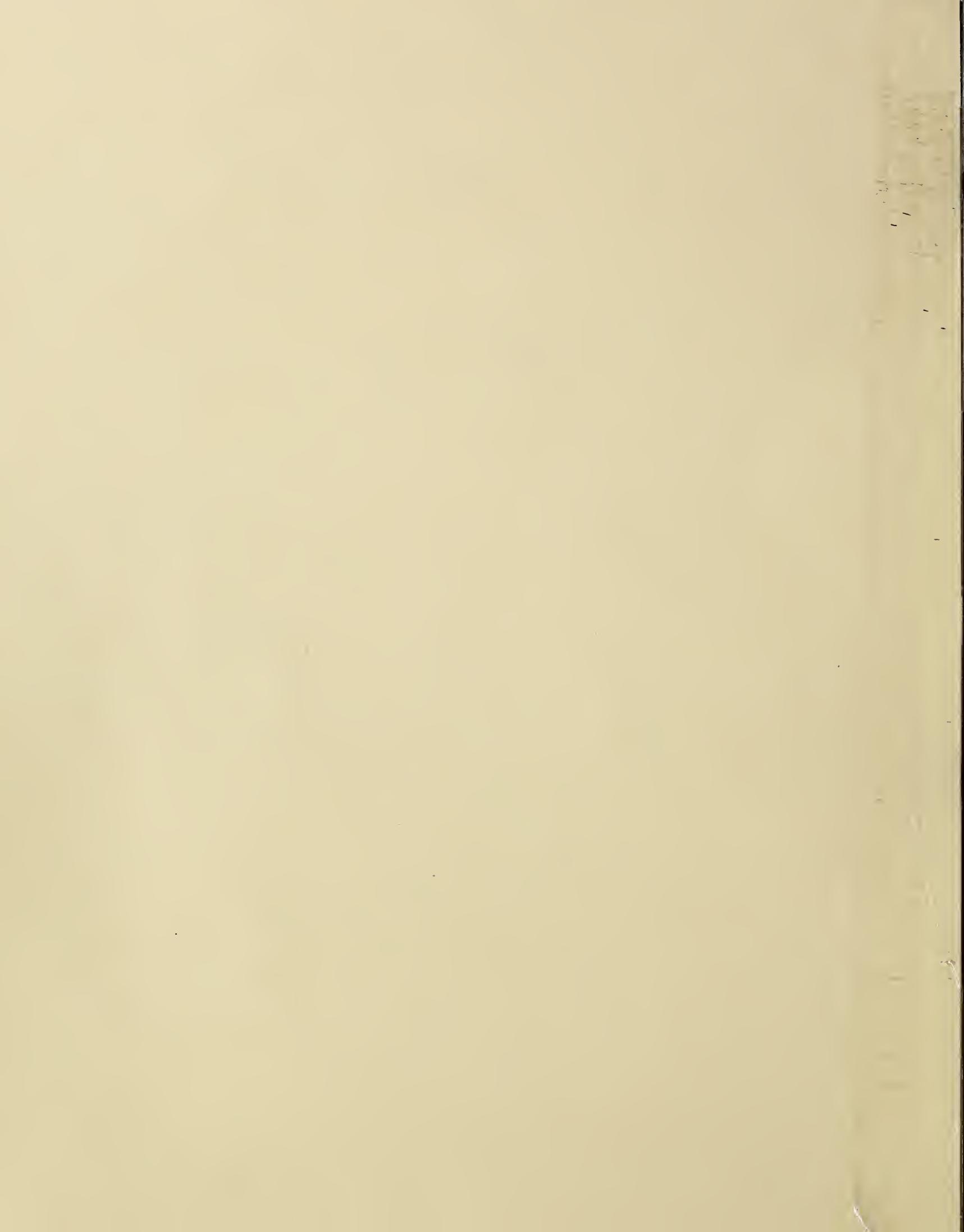


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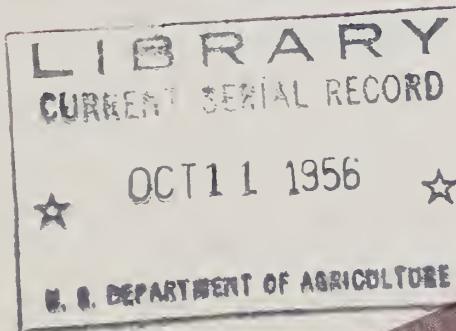
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AGRICULTURAL Research

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POULTRY GAIN

see page 6

RESEARCH HELP

see page 5

KITCHEN EASE

see page 8



UNITED STATES DEPARTMENT OF AGRICULTURE

AGRICULTURAL Research

Vol. 5—October 1956—No. 4

CONTENTS

CROPS AND SOILS

Better Ginning for the Southeast-----	3
When Alfalfa Spreads-----	4
Tetrazolium—Promising Research Tool-----	5
How Pastures Fight Fires-----	6

POULTRY

Our Gains Against CRD-----	7
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FOOD AND HOME

Easy-does-it Kitchen-workroom-----	8
------------------------------------	---

LIVESTOCK

Brisk Business: Feed Additives-----	10
Measuring an Animal's Fat-----	11

DAIRY

Milk's Steady B ₁₂ -----	12
Stilbestrol for Dairy Cows?-----	12

FRUITS AND VEGETABLES

New Crop for the U. S.-----	13
Making Hallocks Last Longer-----	15
Getting Thrips Off Berries-----	15

AGRISEARCH NOTES

New Animal Disease Laboratory-----	16
Pruning Pines Pays-----	16
Reducing Seed Losses-----	16
Irradiating Cotton-----	16

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Even Break

Some of our bothersome surpluses have come about not so much because farmers are overproducing as because they are losing their markets to the manmade materials of industry.

These industrial products are the fruit of millions of dollars worth of research. Specially designed for today's needs, such products have set a pace that was just too fast.

Farm-grown materials failed to keep up with the times.

This doesn't mean farm products *can't* compete. They can. Utilization scientists have done enough work to see that a fair research effort could put many of these lagging farm products back in the race. The potential is there.

Take cotton—competing with synthetic fibers, plastics, glass, paper, and metals. Our scientists are perfecting a chemical treatment to increase weather resistance and thus strengthen cotton in the big outdoor-fabric market—awnings, tarpaulins, tents, and the like. We can learn to tailor cotton to give it the resistance to water, heat, acids, and microorganisms, and other specific properties needed by industrial textiles, as well as the luxury look and feel, the drip-dry convenience, and other qualities that are demanded for apparel use.

Wool is up against some of the same competition. But new research suggests that we can develop wool fabrics that will require little care—so resistant to shrinkage and other defects that garments can be home-laundered and tumble-dried.

Our leather market has been shrunk by substitute materials. Two-thirds of our shoes are now being soled with nonleather materials, and nylon, cloth, and plastic are going into the uppers. There's evidence, however, that we can modify hides chemically to make improved leathers with new properties.

Synthetic detergents have been taking the market away from soap—big outlet for our tremendous supply of animal fats. Researchers are convinced that fats can be modified to regain some of the detergent market, and enter the plastics field.

These farm products can compete if we give them an even break. That means giving them more help from research.

Agricultural Research is published monthly by the Agricultural Research Service, United States Department of Agriculture, Washington 25, D. C. The printing of this publication has been approved by the Bureau of the Budget, September 16, 1955. Yearly subscription rate is \$1 in the United States and countries of the Postal Union, \$1.35 in other countries. Single copies are 15 cents each. Subscription orders should be sent to the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

AGRICULTURAL RESEARCH SERVICE
United States Department of Agriculture



crops
and soils



Better Ginning IN THE SOUTHEAST

New laboratory will concentrate
on this area's ginning problems



MOST MODERN ginning equipment is housed in new Clemson laboratory; another building provides space for fiber-testing clinic, offices. Field cotton enters machine at top, is conducted by air through feeders (1) to gin stand (2) for cleaning and separation of fiber and seeds. Excess from overfeeding goes into overflow (3), back to feeders. Clean lint cotton is carried into condenser (4), which removes air and forms cotton into rough batts that are fed to baler (5).

■ GINNING RESEARCH has begun in USDA's new Southeastern Cotton Ginning Laboratory, located near Clemson (S. C.) Agricultural College.

Cotton grown this year in several Southeastern States is being used in seeking methods and mechanical improvements that will best preserve the inherent qualities of fiber and seed. Market and end-use values may be greatly affected in the few minutes it takes to gin a bale of cotton.

Work at the new laboratory is part of broad cotton-ginning investigations conducted by ARS in cooperation with State experiment stations, ginners, and cotton producers. Other USDA ginning laboratories are operating at Stoneville, Miss., and Mesilla Park, N. Mex. A State-Federal laboratory is located at Chickasha, Okla. To a large extent, these laboratories deal with ginning problems peculiar to each of the areas.

Region has special problems

Similarly, research at Clemson will apply to ginning of cotton grown in

the Southeast. Special problems of this area are created by cultural and harvest methods differing from those used in other areas, by different cotton varieties, and by a gin-to-mill method of handling and selling cotton that is not common to other areas.

The Clemson investigations are being supervised by agricultural engineer J. A. Luscombe, formerly in charge of ginning research at Chickasha. He is responsible for several successful modifications and adaptations of ginning machinery and operations to meet conditions in the high-plains cotton areas.

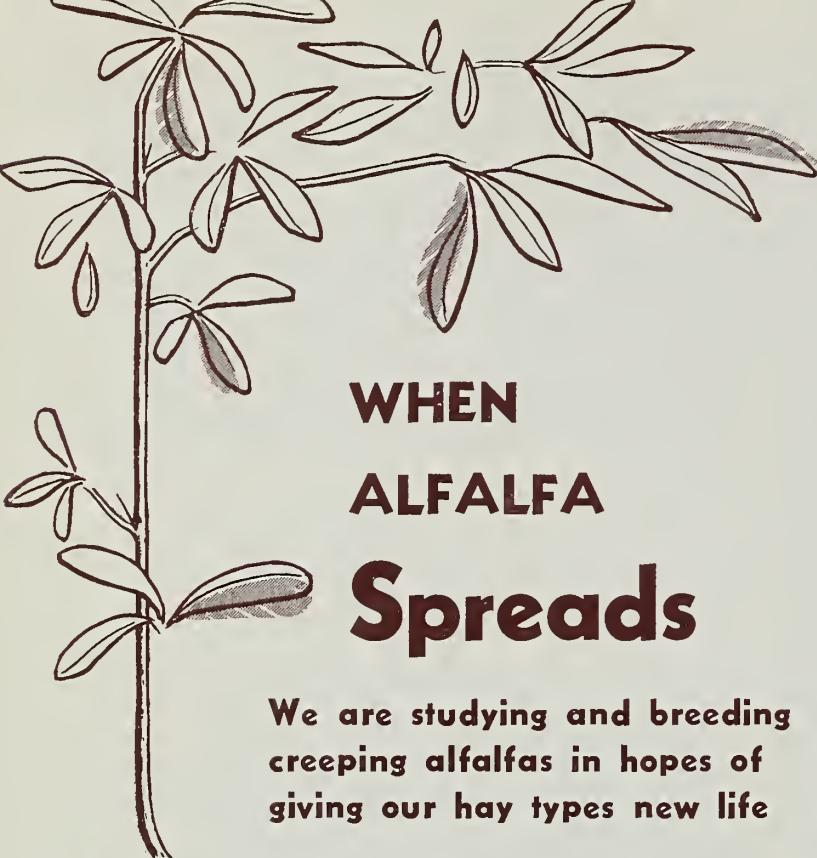
Alabama, Georgia, North Carolina, South Carolina, Virginia, Florida, and the south central portion of Tennessee will be served by the new laboratory. In many respects, cotton cultural and production methods are much the same in these States. Farms are smaller than in other cotton-belt areas. And there are many production problems—such as fertility and weed and insect control—that affect ginning and are peculiar to this area.

Ginning practices must be adjusted to fit the changed requirements of new varieties of cotton, improved cultural practices, new methods of pest and weed control, and altered harvesting methods. Research will also aim toward finding the best methods of handling and storing seed cotton, studying the effect of ginning and allied operations on fiber quality, and determining the moisture content of cotton needed to produce the best gin operation and a top product.

Work serves growers, users

A major goal will be preservation of the inherent qualities of lint and seed to provide maximum returns to growers. Further, research will aim toward meeting end-use requirements of mills and others to keep cotton competitive with synthetic fibers.

The Clemson laboratory will help realize these goals. The most modern machinery and equipment have been installed for drying, cleaning, ginning, and pressing according to the requirements of each lot of cotton.★



WHEN ALFALFA Spreads

We are studying and breeding
creeping alfalfas in hopes of
giving our hay types new life

■ USDA AND STATE RESEARCHERS may someday give our alfalfas the creeping habit and a second life in the battle for survival against their numerous enemies.

There's reason to believe that the spreading form of alfalfa can withstand attack from rodents that thin the stand in parts of the West by cutting the vital taproot. In the East, numerous climatic, soil, and disease factors may cause the stand to die out. Spreading alfalfa gives several replacements for each mother plant.

Spreading alfalfa is a desirable pasture plant because of its ability to increase in thickness of stand when grown either alone or with grass. Its crown is deep set—thus not as subject to injury from trampling by livestock as the shallow-crowned hay types of alfalfa.

Forage-crop breeders at seven locations are appraising a wide collection of alfalfas with the spreading habit to see how effective that character is and what other qualities the plants have. The work centers under agronomist H. O. Graumann at the Agricultural Research Center, Beltsville, Md. Tests are carried out in ARS field locations by H. L. Carnahan, State College, Pa.; C. H. Hanson, Raleigh, N. C.; W. R. Kehr, Lincoln, Nebr.; E. L. Sorenson, Manhattan, Kans.; M. W. Pedersen, Logan, Utah; O. F. Smith, Reno, Nev.; and associates.

Old spreading types lack productiveness

We've known about these alfalfas a long time. One was introduced in South Dakota about 1900. None is productive enough for wide adoption; ability to spread is their chief asset. The source of creeping character is not understood. It may be inherent in some Siberian alfalfas

of the *Medicago falcata* species and possibly was crossed from them into various alfalfas. Or perhaps complementary genes brought together from separate species collectively cause this spreading behavior.

The so-called Canadian spreading alfalfas increase vegetatively by sending up sister plants from the mother's underground roots. Most creepers are low-growing and less productive than the tall, wide-crown kind grown for hay. They're best adapted and used for pastures.

One rhizomatous (stem-sprouting) type of alfalfa discovered in Oregon spreads vegetatively when grown in that general area but seldom expresses this character when grown elsewhere. Scientists are trying to find why.

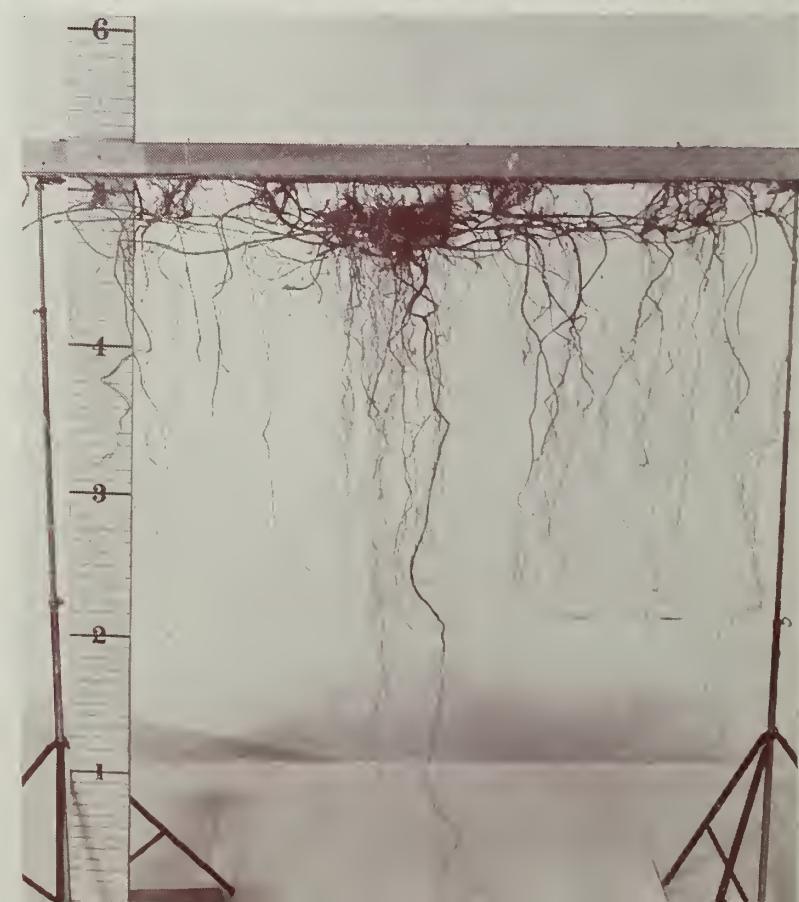
A large group of alfalfas with either of these spreading characters is under study. All are being evaluated for general characters such as reaction to diseases, productivity, persistence in combination with grass, quality, hardiness, and adaptability—as well as effectiveness in spreading and persistence under grazing.

Breeders try to build in ability to spread

The scientists have crossed spreading types with our outstanding hay alfalfas. Each successful hybrid will be examined for all characters. Crossing the rhizomatous and creeping-rooted types has also been done to combine a double insurance feature into a single plasm.

Main objective is to add spreading ability to the best of our hay types that have multiple disease and insect resistance. Attempts will also be made to transfer any other special assets found in the spreading forms.☆

CANADIAN CREEPING ALFALFA plant 3 years old was excavated in Kansas tests. It had 48 crowns spread over an area 5 feet square.





TETRAZOLIUM

. . . PROMISING RESEARCH TOOL

This chemical helps preserve disease organisms, determine seed viability, reveal virus infection

■ A NEW TOOL is helping keep deadly plant organisms alive and healthy—so they can be killed later.

This method of preventing deterioration of certain captive plant-disease organisms is one of the latest developments of two USDA plant pathologists working at the Agricultural Research Center, Beltsville, Md. The chemical they have put to this use is tetrazolium. Chemists call it 2,3,5-triphenyl tetrazolium chloride. It's an oxidation-reduction compound, presently significant as an unusual tool in biological research.

Plant pathologists have always had trouble preventing deterioration of disease organisms in the laboratory. They need highly pathogenic organisms—good healthy ones—to infect healthy plant tissue. Thus, they can study the effects of a particular disease and ways to get rid of it.

Bacteria weaken in storage

Ordinarily, disease organisms are cultured to keep a ready supply on hand. But many kinds of cultured organisms change—become weakened with storage and practically useless for reinfection purposes. Then the scientists are faced with the difficult task of getting a fresh supply of the organisms from infected plants.

The Beltsville scientists decided to work with tetrazolium, a comparative oldtimer in the field of chemistry, to see if they could utilize certain of its proven qualities to keep the highly pathogenic bacteria continually available. In 1955, A. Kelman, of the North Carolina experiment station,

found that by incorporating tetrazolium into media on which the southern bacterial wilt organism was grown, he could obtain bacterial colonies of red and white shades. In his experiments, the *white* colonies produced a severe disease; the *red* colonies, a mild disease or none at all.

Color related to virulence

ARS researchers B. C. Smale and J. F. Worley enlarged on these trials and grew a number of organisms in media containing tetrazolium. The organism that causes halo blight of bean was studied most intensively. In the resulting colonies were found two distinct colors—red and white—and various inbetween shades. Results were the opposite of those obtained in the Kelman experiments: *red* colonies proved highly infectious, *white* colonies much less so.

The exact nature of color differences as related to the infectivity of bacteria is not well understood. Differences in growth and respiration rates of bacteria are thought to be responsible; the color change occurs most rapidly in the presence of highly infectious bacteria.

Other organisms being studied with the help of tetrazolium at Beltsville include those that induce pepper leaf spot, soft rot of vegetables, fire blight of apples and pears, crown gall of tomatoes, and cabbage black rot. Color differences were apparent in colonies of all but the cabbage disease organism. The scientists are now relating these color differences to disease production in plants.

Establishment of a positive relationship between color and virulence of organisms would be a boon to plant pathologists. It would help them to obtain plant pathogens rapidly, at low cost, and with assured results.

Tetrazolium is also useful in other ways. In some instances, it can be used to determine seed viability; the viable seeds turn red much more rapidly than nonviable seeds. The Germans originally discovered this application some 50 years after they first prepared the compound in 1894.

About a year ago, Beltsville researchers discovered that tetrazolium could also be used to detect virus-infected plant cells. The same basic principle of color change apparently applies. Virus-infected plant tissues treated with tetrazolium turn red much more quickly than tissues taken from virus-free plants. Some virus diseases progress slowly and go unnoticed; gradually declining yields often provide the only clue to an infected crop. An early indication of infection would be helpful in effective and rapid treatment. Tetrazolium has not yet been used to detect virus-infected plants in the field.

Several possible uses seen

Tetrazolium has only recently been used as a check on bacterial motility, or motion. Using a needle stab to place bacteria into soft agar mixed with tetrazolium, researchers at Loyola University of Chicago found that motile bacteria cause redness throughout the media. Nonmotile bacteria are red only at the stab.☆

How pastures fight fires



■ WELL-GRAZED STRIP PASTURES of superior forage can offer low-cost fire protection in the expansive woods of the southeastern Coastal Plain.

A 4-year cooperative experiment by USDA's Forest Service and ARS, the North Carolina experiment station, and the State Department of Agriculture showed that sod strips 18 feet wide provide good firebreaks in these rather inaccessible wet forests. And if well developed and managed, the forage will largely pay for development and maintenance.

Ditching edges of fire lanes and using the dirt to crown the strip raised the soil level and prevented drowning the plants. It also gave a firm traffic base for fire equipment, which often can't get through.

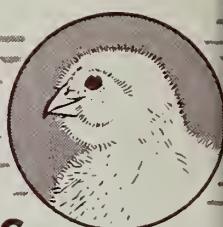
Conventional good practices for starting pastures were used. A combination of legumes and grasses was ideal. Legumes contribute nutritious grazing and some nitrogen for the grasses, cause close grazing to reduce fire hazard. Being cool-weather plants, the perennial legumes Ladino and Louisiana white clover and big trefoil stretch the grazing season and are green and noncombustible in fall and winter. In eastern North Carolina, clovers were, on the whole, the best legumes. They started well and would never burn. By the third year, however, big trefoil was as thick a ground cover, and just as noninflammable.

The combination of a legume and grass gave better ground cover and crowded out weeds, which are a fire hazard and have less feed value. Redtop was the best of the tested grasses in stand establishment, but it was more inflammable and less palatable than alta fescue. The slow-starting Dallis grass almost caught up in stand and exceeded Redtop in yield by the third year. Although the cool-season legumes and alta fescue or orchard grass provided lowest flammability during fall and winter, there was possibility of improving summer grazing by adding a little warm weather forage—Dallis grass or lespedeza—to the mixture.

This study was made at Plymouth, N. C., by W. O. Shepherd and R. H. Hughes, USDA Forest Service; E. U. Dillard, North Carolina Experiment Station; and J. L. Rea, State Department of Agriculture.☆



OUR GAINS AGAINST CRD



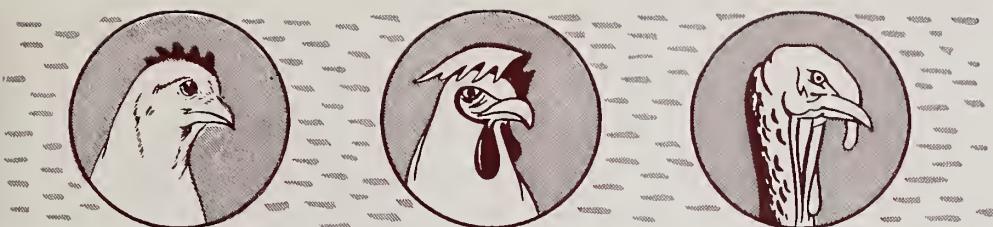
We've learned much about its cause and spread, but there's a long way to go on diagnosis and control

■ EXHAUSTIVE INVESTIGATION of a relatively new poultry disease—one that annually costs our broiler industry at least \$25 million—has produced much practical information to help wipe out this expensive menace.

Known as chronic respiratory disease (CRD), it was first reported in the United States in 1943. By 1951, it was prevalent throughout the Delaware-Maryland-Virginia broiler-producing area. Now, it is widespread and is considered the number-one disease of the broiler industry.

In June 1952, the disease had reached such serious proportions that seven State experiment stations entered into cooperative research with USDA in an effort to stamp it out. Later, four additional States joined. Participating States now include Connecticut, Massachusetts, Delaware, Maryland, Virginia, North Carolina, Georgia, Texas, New York, Minnesota, and Washington.

Broiler growers early applied the term "air sac infection" to this disease because autopsies showed that air sacs in the abdominal, thoracic, and heart regions were generally infected. Course of the disease, including the incubation period, varies from 7 to 68 days. Mortality ranges



from 8 to 50 percent. Greatest economic losses come not from mortality but—even more important—from retarded growth rate, prolonged feeding time, increased numbers of culls, and lowered carcass quality.

Chronic respiratory disease is caused primarily by pleuropneumonia-like organisms (PPLO), the same organisms that cause infectious sinusitis in turkeys. Both CRD and infectious sinusitis display similar symptoms—nasal discharge, respiratory rales, slow spread, decline in egg production, loss of body weight, and persistence of symptoms.

Several organisms involved

In addition to the viruslike PPLO, other agents such as yeasts and *Escherichia coli* organisms can also cause CRD. Yeasts play a minor part as contributing agents; *E. coli*, however, often has a larger and more important role. In many cases, tissue examinations of birds have shown that typical air-sac infection lesions yielded pure cultures of *E. coli*. These organisms are associated not only with CRD but also with some of the other poultry respiratory diseases.

The *E. coli* organisms found in the intestinal tract of poultry are normally harmless and passive. But under certain conditions—for example, sudden temperature extremes, temporary lack of feed or water, live virus vaccination against respiratory diseases—these ordinarily peaceful organisms may begin to act up. Then they can cause damage.

Diagnosis of CRD still isn't easy, even after years of investigations. Various artificial culture media have been developed for isolating and identifying the causative organism

PPLO. Other methods include bird-inoculation tests, histological techniques, and serological procedures.

The problem of isolation and identification by culture media is still slow, tedious work. Use of bird-inoculation tests for disease diagnosis requires much time and facilities, and is expensive. Histological procedures of diagnosis—examination of lung and tracheal specimens for PPLO lesions—are fairly rapid and reliable. But not many diagnostic laboratories have personnel and equipment to carry out this highly specialized diagnostic technique. Diagnosis by serological methods is considered to be in an experimental stage, although these methods have been developed to the point where they are being used in some laboratories. Most promising right now are the hemagglutination-inhibition, microscopic tube, and slide-agglutination tests. Before long, one of these should be chosen for rapid field diagnosis of CRD.

In general, injection of suspected material into sinuses of chickens or turkeys immune to Newcastle disease and bronchitis results in sinus enlargement in positive cases. This method provides good CRD identification and is fairly widely used.

Disease spread through eggs

Research on CRD elsewhere has shown no immunological differences in PPLO strains from various parts of the country and from different sources, such as chickens, turkeys, pheasants, pigeons, cattle, goats, and swine. CRD dissemination was found to take place from infected breeders through the egg to the offspring. The disease was found in birds 1 year after hatching.

The presence of PPLO in a very large percentage of eggs from infected breeders has been established by several investigators. Most of these eggs do not hatch after pipping, indicating that incubator transmission of CRD may be another important factor in its general dissemination.

Antibiotics not encouraging

How about the use of antibiotics in treating CRD? Veterinarian O. L. Osteen, of the ARS Agricultural Research Center, Beltsville, Md., is not too encouraging. There are recorded instances where antibiotics have been beneficial in treating and preventing CRD. Yet, if control birds suffering from CRD are kept and compared with treated birds at slaughter time, the weight differences in the finished broilers will be slight, Osteen reports. Many researchers doubt if the slight weight advantage in the treated birds compensates for the cost of antibiotics used, in comparison to profits from the untreated group.

What, then can be done? Certainly, good feeding and good husbandry practices cannot be replaced by antibiotics or vaccines. These desirable practices should continue to be a grower's main bulwark against CDR and other diseases as well.

In time, concerted efforts of ARS and State researchers should provide a more thorough understanding of the organisms causing CRD. This will permit reliable and rapid diagnosis, a big step forward in control. Projects are now underway at Beltsville and at cooperating State stations to further identify and characterize the CRD causative agent, to differentiate between strains, and to develop means of control and eradication.☆

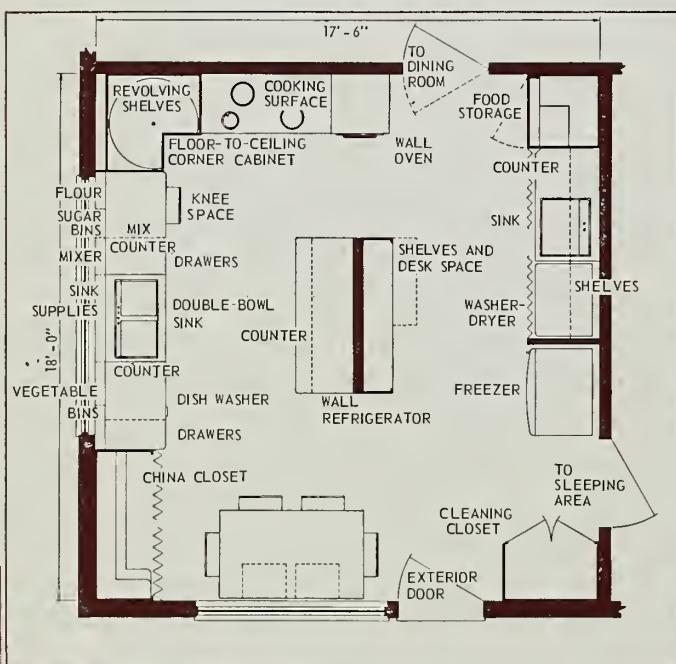


**food
and home**



1. Sitting at mix center, homemaker can reach tools and ingredients from pegboard and revolving cabinet at right, and flour and sugar bins at back. Mixer moves on ball-bearing casters. Adjustable stool stores under counter.

2. Lifting a roast into this oven is easy. The side bottom of the oven is 32 inches from floor, with most-used racks 35 and 40 inches—heights found best in ARS energy study. An adjoining surface cooking unit is 35 inches high.



Easy-does-it **KITCHEN-WORKROOM**

**Research-based design saves time, energy
of homemakers—handicapped or ablebodied**

ENERGY-SAVING kitchen-workroom, designed by USDA housing specialists on the basis of research on energy costs and space needs, has areas for food preparation, service and storage, laundry, home office work. Kitchen area is separated from workroom by wall refrigerator and counter backed by shelves and desk space. A passageway between refrigerator and range at far end permits access to other rooms. Dining area provides uncrowded eating space for six. In the workroom area at right is the freezer. Just beyond are the washer-dryer and sink with shelves above it for storing flower containers and laundry supplies. An accordion-type folding door closes off this area when not in use. Next to laundry at far end of workroom is storage closet with shelves built on inside of the door to hold canned goods. The door, supported by a heavy-duty roller, opens and shuts easily.





Dish cabinet is near both dining table and dishwasher. Often-used items are kept in easy-to-reach storage 32 to 63 inches from the floor. Homemaker seated at table can reach the pull-out shelf holding toaster and appliances.



4. Cleaning up takes less energy when dishes are brought to the sink on a cart and homemaker sits while rinsing them before putting them in dishwasher. The sink has one shallow bowl with drain set back to provide knee room.



5. At desk built on back of refrigerator wall, homemaker can plan meals, make out market orders, pay bills, and use telephone. Shelves take care of recipes, bills, radio, books, other items. Wicker chair provides restful sitting.

■ EASY REACHING, FEW STEPS, sitting at work, little pulling and pushing of doors and drawers are energy-saving features of this kitchen-workroom. It was designed by USDA housing specialists especially for the many homemakers who must conserve energy because of chronic illness or age. But ablebodied housewives will also find that the designs and equipment arrangements will save time and energy. Developed at ARS home-economics laboratories at Beltsville, Md., it is the first in a series of kitchen designs based on research into energy costs and space needs for performing household tasks.

Adequate areas for food preparation, service and storage, laundry, and home office work are provided in a room about 18 feet square. A wall refrigerator and counter backed by desk and shelves form a center island. Counter at left of sink is 36 inches wide and that at right 42 inches, meeting space requirements determined by research as suitable for mixing and food preservation.

The oven is installed so that the lowest shelf is about counter level. Storage units and refrigerator are placed so that a homemaker need not reach higher than 63 inches nor lower than 27 inches from the floor for the items used in everyday food preparation. These limits of reach for the woman of average height were established by researchers on the basis of energy studies.

Walking is reduced to a minimum in the kitchen area. Mix counter, sink, and range are placed close together, since research has shown that these three units are the most frequently used in meal preparation. The refrigerator, which ranks next in frequency of use, was placed

across from the mix counter. Storage space is provided at each work center for supplies and utensils used there. Freezer and canned-food storage cabinet are easily accessible in the workroom area. The dining area is near dish cabinet and dishwasher so that setting the table and replacing dishes after washing takes few steps. With a cart, only one trip is needed to transfer a meal from range to table or the dishes from table to sink.

In this kitchen, a homemaker can sit comfortably at the sink for long jobs such as washing and preparing vegetables and cleaning up after meals, at the mix counter for preparing batters and other foods. The shallow bowl of the double sink, with drain set well back of center, and the open space under the mix counter allow plenty of knee room for sitting. From the swivel chair at the table, a homemaker can use coffee pot, toaster, or other appliances on the pull-out shelf in dish cabinet.

Few cupboard doors need to be opened and closed in preparing and serving meals. Accordion-type door of the dish cabinet folds easily out of the way. Door of circular supply cabinet is attached to the shelves so that one push opens the cabinet and revolves shelves to the desired position. Storage drawers and pull-out shelves glide out easily on nylon bearings or rollers.

Counters are covered with easy-to-clean laminated plastic. Pattern of the vinyl floor covering is light and attractive but does not readily show spots and mars.

Detailed working drawings are in preparation and will be made available through the Regional Plan Exchange Service at most State agricultural colleges. ☆

**Brisk business:**

Feed Additives

Many growth-promoting chemicals reached farms rapidly and are now widely used by our feed makers, marketing survey shows



■ RARELY HAVE RESEARCH developments reached the farm as promptly as did the feeding of antibiotics, vitamins, and other growth-promoting chemicals to livestock. Within the past 5 years, feed mixers have made wide use of substances found practical only within the past decade.

In a USDA survey, economist V. J. Brensike of the Agricultural Marketing Service, found that over half the formula feeds made recently for poultry, hogs, dairy, and beef cattle contained low dosages of growth-promoting antibiotics. About half also had vitamin B₁₂, first identified in 1948. This vitamin, a byproduct of antibiotic manufacture, is needed now that animal proteins are used relatively less. Stilbestrol for faster gains in beef cattle and dienestrol diaeetate for fattening poultry are hormones extensively adopted by feed mixers, over the last year or two.

Hormones are available to livestock and poultry feeders in formula feeds. Antibiotics come in formula feeds and concentrates as well as solvents to add to drinking water. Only three antibiotics—penicillin, Aureomycin, Terramycin—are used much in formula feeds, but some poultry and hog feeds have bacitracin and other antibiotics. About two-thirds of the mills use penicillin in feeds for young chickens, half of the mills in layer and breeder feeds. But the other 2 antibiotics prevail over penicillin by 8 or 9 to 1 in feeds for larger stock.

Variety of materials tried

Among other feed additives, arsenicals (arsenic-bearing compounds) have been used extensively in poultry feeds during the past 5 years, and certain surfactants (detergents) are substituted for antibiotics in a few poultry mixes. The surfactants, used for

an imagined germicidal effect, probably have a limited future in competition with the superior antibiotics. The arsenicals, which were tried unsuccessfully as a therapeutic against poultry diseases, often aid growth and seem to improve feathering.

Of the 327 feed mixers surveyed, 254 used antibiotics, 237 used vitamin B₁₂, 123 used arsenicals, and 5 used surfactants in their formula feeds. This sample represents a tenth of the mills doing about a third of the feed business. Poultry feeds are mixed in 305 of those plants, dairy feeds in 301, hog feed in 282, and beef cattle feed in 282. About 93 percent of the poultry mixers started using antibiotics and vitamin B₁₂ within the last 5 years. Arsenicals were also adopted by most of the large poultry feed plants within the last 3 or 4 years.

Widely used in swine feeds

About 60 percent of the plants mixing hog feeds used antibiotics, and 53 percent used vitamin B₁₂. Few plants used these additives in cattle feeds. About 20 percent of the mixers added antibiotics and vitamin B₁₂ to dairy feed (mostly for calves), less than 5 percent to beef feeds.

Brensike found that large firms get drugs chiefly in three forms—mostly in carriers or concentrated premixes used at rates varying from 1 to 20 pounds per ton of finished feed, and to a lesser extent in pure drug form. Smaller mixers buy them mostly in complete concentrates (lacking grain and sometimes protein). The drugs obtained pure or in a carrier are generally put into a premix before combining in a concentrate or feed.

It takes good equipment adapted to mixing small amounts to have adequate quantity control and proper distribution of the drugs, in accordance with Food and Drug Administration requirements. Plants so equipped sometimes sell premixes or concentrates to other mixers.★



Measuring an Animal's Fat

Timing of drug-induced sleep may provide a harmless, direct way in live animals

■ DETERMINATION OF FAT in the intact living animal by a method unique in agriculture holds potential significance in beef and pork marketing.

By putting animals to sleep with certain anesthetics, USDA researchers are able to correlate length of their sleep with fat content. The shorter the sleep, the more fat.

Earlier work elsewhere had shown that fat tissue has a high affinity for certain brief-acting chemicals of the thio-barbiturate group, such as Thiopental and Kemithal. Their brief action, researchers found, was due not to rapid destruction but to their localization in the fat depots of the body. Further experimental work bore this out with tests showing that fat rats recovered from Thiopental and Kemithal anesthesia nearly twice as fast as lean rats. Semistarvation also was shown to prolong the slumber time of test animals under this anesthesia; animals had, of course, less body fat after semistarvation.

With this information, former ARS chemist Louis Feinstein, now with Agricultural Marketing Service, assisted by F. J. Fulmine, began experimentally administering these two sleep-inducing drugs to pigs. The work showed a high correlation between sleeping time and fat content.

Live-animal method needed

A precise method of measuring relative proportions of bone, muscle, and fat in live animals has long been sought. Many methods have been tried in the past with varying degrees of success. Such information can provide a basis for better selective livestock breeding. It can also pro-

vide considerable information on changes occurring during growth and fattening, and give a better index of sales value by providing objective, accurate grading before slaughter.

Pigs given sleep inducers

Some of the previous methods used for such determinations were based on measuring water content of the animal. Antipyrine, a drug known to medicine for its usefulness in breaking fever and relieving pain, is being currently used with some success for this purpose. After injecting a measured dose of antipyrine into the animal, scientists analyze a sample of withdrawn blood to determine body water content. Knowing the animal's weight they can figure the fat (AGR. RES., August 1953, p. 6).

Preliminary experiments got underway in the spring of 1954 with 13 pigs receiving injections of Kemithal or Thiopental at various times. Time was noted when the test animal went to the floor after losing its ability to stand on its two front feet. The period between collapsing to the floor and again standing on its front feet was called the sleep period. This varied up to a maximum of 1 hour, depending on amount of anesthetic and fat content of the animal. Amount of anesthetic varied with the animal's weight. Each animal determined its ability to right itself.

Growth-weight curves were obtained on all animals to be sure they were not growing abnormally because of frequent sleep times. During growth—weaning to slaughter—animals were given Kemithal and Thiopental many times. Each animal

promptly went back to eating after righting itself following recovery from anesthesia.

In followup experiments, pigs were taken right after weaning and fed a regular diet. This time, only Thiopental was used to induce sleep. As the animals grew, both Thiopental and antipyrine were injected through the abdomen and the sleep time and body water determined. Periodically, one animal was slaughtered and chemically analyzed, and the specific gravity of the carcass determined.

Other methods used to determine body fat have included measurements of body density and total body water.

Body density has been measured by various water and air-displacement methods and gas-dilution techniques. Some of these are cumbersome and time-consuming and cannot be used on the living animal; but they are useful in carcass studies.

Anesthetic is independent

Total body water can be judged by desiccation, specific-gravity measurements, and dilution techniques (such as the antipyrine method). Both desiccation and specific-gravity measurements are valuable but cannot be used on live animals. So far, the dilution technique, utilizing antipyrine on the live animal, has proved most satisfactory. This, however, has the disadvantage of varying among test animals because of metabolic and physiological differences.

Kemithal and Thiopental anesthetics, now in trial use, have the big advantage of providing a completely independent method of determining fat directly in a living animal.☆



MILK'S STEADY B₁₂

■ VITAMIN B₁₂ CONTENT of cow's milk is substantially unaffected by pasteurization or diet, and is about the same for Holsteins and Jerseys.

These conclusions were reached by USDA scientists working at the Agricultural Research Center, Beltsville, Md., in tests to determine how various factors influence the vitamin B₁₂ content of dairy products.

Among cheeses tested, natural Swiss was highest in B₁₂ value—about twice that of processed Swiss.

The fact that dairy products were sources of vitamin B₁₂ was first established by USDA scientists in 1949. But very little information has been developed since that time on the potency of dairy products as sources of this essential vitamin.

British researchers first established the value of dairy products for supplying B₁₂ through studies of vegetarians, some of whom abstained from all animal protein. The scientists found that vitamin-deficiency symp-

toms soon developed in some of the vegetarians not eating animal protein; giving vitamin B₁₂ alleviated these symptoms. Vegetarians eating dairy products did not develop symptoms.

Using rat-assay test methods, Beltsville scientists found no difference in vitamin B₁₂ value between raw milk from Holsteins and Jerseys, or that from barn-fed and pasture-fed cows. Storage of raw milk in a household refrigerator at 32° F. for 3 days did not change the B₁₂ content.

The reason that milk is so little affected by the cow's ration (provided adequate cobalt is supplied) is accounted for by the ability of microorganisms in the rumen to synthesize the vitamin. Addition of cobalt to cow rations above the amount normally required for good health failed to increase vitamin B₁₂ content.

Vitamin B₁₂ value of natural Swiss cheese averages 36.2 micrograms per kilogram—about twice that of processed Swiss. Natural Cheddar has



a B₁₂ value of 20.8, with processed Cheddar averaging 12.0, or about three-fifths as much. No correlation was observed between mildness or sharpness of Cheddar cheese and vitamin B₁₂ content. Cottage cheese, with a B₁₂ value of 8.0 micrograms per kilogram, contains less than one-fourth the amount in natural Swiss.

The greater vitamin B₁₂ content of Swiss is probably due, ARS dairy specialists feel, to synthesis of the vitamin by propionic-acid bacteria involved in making this cheese.

Little or no vitamin B₁₂ loss occurs during manufacture and curing of Cheddar from pasteurized milk. About half of the vitamin originally present in the milk goes into the cheese and the rest goes into the whey.

Definite vitamin B₁₂ requirements for human beings have not yet been established. Researchers have found, though, that 1 quart of fluid whole milk furnishes, on the average, 6.7 micrograms of the vitamin.

Amounts of various cheeses needed to supply 1 microgram of dietary B₁₂ have been estimated as follows: natural Cheddar, 1.7 ounces; process Cheddar, 2.9; process Cheddar cheese food, 4.1; process Cheddar cheese spread, 7.0; natural Swiss, 1.0; process Swiss, 1.9; cottage, 4.4.★



Stilbestrol for dairy cows?

■ STILBESTROL, a hormonelike chemical used successfully in recommended quantities to promote rapid, efficient weight gains in beef cattle, does not increase or otherwise influence milk production in dairy cows.

USDA dairy scientists, in conducting experiments at the Agricultural Research Center, Beltsville, Md., have obtained negative and similar results from two trials. These feeding experiments were conducted under the direction of ARS dairy physiologists J. F. Sykes and T. R. Wrenn.

For purposes of comparison, each test was set up to run for a period of 180 days. This included 60 days of prefeeding, 60 days of adding stilbestrol to the feed in the recommended quantity of 10 milligrams (approximately 1/2800 ounce) daily per cow, 60 days of postfeeding.

In neither trial did use of the drug as a feed additive increase the production of milk, the fat percent of the milk, or the persistency of lactation. No harmful effects from feeding the drug were noted. The cows'

feed consumption and weight gains indicated no change that could be attributed to the use of stilbestrol.

Digestibility of the ration, particularly the fiber portion, appeared to be slightly increased, but this change was not reflected in changes in milk production or body weight.

As a result of these experiments, ARS dairy nutritionists do not recommend use of stilbestrol as a means of increasing milk production, building up the fat percentage of milk, or extending the lactation period.★



NEW CROP for the U.S.

We have a big market for pistachio nuts, and USDA work is improving varieties and production methods

■ PISTACHIO NUTS enjoy the distinction of being one of the few crops of which there is always a shortage.

United States importers, already taking half the world's estimated annual crop of 15 million pounds, insist they could handle 50 million.

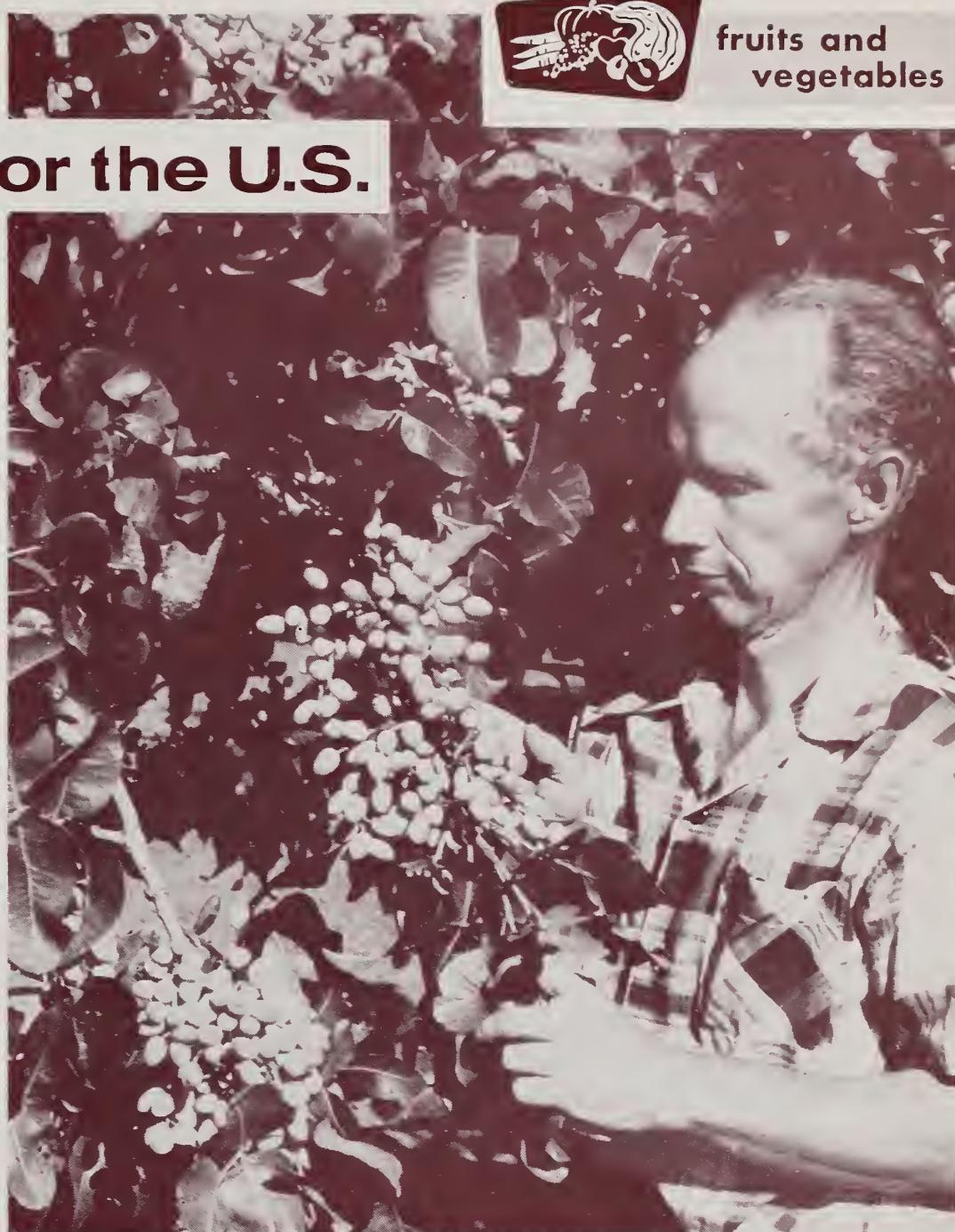
The 7 to 10 million pounds consumed here each year are imported largely from Turkey, Syria, Iran, and other Middle East countries. Italy produces a half million pounds some years, and exports a few. A small quantity is produced commercially in California. Even considering pistachio orchards recently started here and abroad, it will be 10 years before world output attains an estimated 30 million pounds a year.

Research improves pistachio

Research by USDA horticulturists has helped to improve the pistachio nut—not only here but in foreign lands of which the tree is a native.

USDA's collection of *Pistacia* species—both nut bearing and ornamental—dates back fully 40 years. But emphasis on the evaluation of this nut began in 1929. Horticulturist W. E. Whitehouse was sent to Russian Turkestan, Iran, and other countries in quest of seeds, scions, and cultural information from areas in which pistachios grow.

The plant material he collected, added to the collection already available in this country, made possible the beginning of intensive cultural



GRAPELIKE CLUSTER of pistachio nuts about ready for harvest at Chico, Calif., is displayed by horticulturist L. E. Joley, working with W. E. Whitehouse in developing this crop.

studies of *Pistacia* in 1935. These ARS investigations are carried on at the U. S. Plant Introduction Garden, Chico, Calif., by Whitehouse and L. E. Joley. Out of the work have come several promising varieties producing a good yield of large, highly split nuts of excellent flavor.

In addition, nine species show promise as ornamentals. Among these are evergreens, and others notable for their beauty in the fall when the leaves color much like New England maples. Development of im-

proved varieties, root stocks, and pollinators were among the first steps taken to adapt nut-bearing trees.

Both heat and cold required

The pistachio nut thrives best in areas having cool enough winters for properly breaking bud dormancy, and hot, dry summers for maturing nuts. In Iran, for example, the best pistachio-nut orchards are grown at an elevation of 4,000 feet on the extensive plateau that makes up the heart of that country. Rainfall averages 10



EXPERIMENTAL ORCHARD of pistachio trees is pictured at U. S. Plant Introduction Garden, at Chico, Calif. These trees, planted 17 years ago, have been bearing since 1948. A pistachio orchard usually

contains about 48 trees to an acre, including 4 male trees set among the fruit-bearing females to assure pollination. Harvesting nuts and removing the pulpy covering (inset) are still largely hand operations.

to 15 inches a year and summer temperatures reach 100° F. during the day, but nights are cool and winter temperatures frequently drop to 0° F. in the northern portion of the plateau.

Good site and treatment pay

In general, areas adapted to almonds and olives appear to be suitable. Pistachios survive drought that would injure many fruit trees. But they do best on good orchard sites under cultural treatment similar to that given other nut crops.

In the United States, favorable environmental conditions are found in the San Joaquin and Sacramento valleys of California and similar areas.

Once an orchardist establishes a stand of trees, he can expect a light crop in the ninth year. Good crops are usual every other year, beginning with the thirteenth. The grower of pistachio nuts will also have something to hand down to posterity. Orchards in Turkey and Iran are still bearing well after 500 to 800 years.

But the crop has disadvantages, too—especially from the viewpoint of efficient production in this country.

The nuts grow in grapelike clusters on the branches of female trees. Harvesting is done by spreading a canvas

under a tree and tapping the branches with a long bamboo pole. Mechanical shakers, tried in California last year, may prove more efficient.

Each pistachio nut is covered by a pulpy pericarp that must be taken off before it dries. This soft-fleshed covering contains tannin and resins that stain the shells unless it is removed without crushing. Nuts with stained shells sell at a lower price.

Normally, some of the pistachio shells split as they mature in the pericarp. The percentage failing to split varies widely among varieties.

In the old country, workers patiently remove the soft pericarp by hand and gently crack each unsplit nut by tapping it with a rock or by crushing it with pliers. Whitehouse's partial answer has been to produce new varieties having a high percentage of naturally split nuts.

Mechanical methods of removing the pericarp and of separating the nuts with undeveloped kernels and un-split shells are awaiting investigation.

Accurate foreign yield records are not available. Average yields of 100 pounds of cleaned field nuts per tree are said to be obtained every other year from 100-year-old Turkish trees. Test plantings at Chico are 16 years

old and reports on growth and yield will be made from time to time.

Pistachio trees are dioecious. Male trees are fruitless but bear staminate, pollen-producing flowers. Female trees have only pistillate flowers, which must be pollinized to form fruit. Usually, 1 male tree is planted in a favorable location among about 12 females to assure pollination.

Some of the nuts of the clusters produce shells and pericarps but no meat. Orchardists in the Middle East separate the good pistachios from the bad by the water-bath method. Nut with undeveloped kernels float.

Pistachio has many outlets

After harvest, removal of the soft pericarp, and drying, pistachio nuts are processed by salting and roasting. In this country, the shells of some of the nuts are colored with a red vegetable dye to attract customers. Such nuts are sold largely through vending machines, which dispense about 20 percent of the total quantity we use each year. Another 40 percent is pre-packaged for grocers and other retailers, and the remainder is dispensed in bulk. Nearly all of the shelled pistachio nuts go to manufacturers of bakery goods and ice cream.★



Making hallocks last longer

■ AN INEXPENSIVE PROCESS for increasing the life of picking boxes for berries is helping commercial berry processors in the Pacific Northwest save thousands of dollars a year.

It calls for treating picking boxes—known as hallocks—with a chemical fungicide, sodium orthophenyl phenate. This chemical reduces the growth of molds on hallocks and considerably prolongs their usefulness.

During off seasons, processors buy bales of thin wood called shook. From this, millions of hallocks are made. Freezers and canners supply the hallocks to growers, along with wooden crates (flats) that hold the hallocks. During processing, these hallocks are used repeatedly in transferring berries from field to plant. Mold growth often results from repeated use, encouraged by soil and soaked-in berry juices. Wet weather may also hasten the loss. Some sea-

sons, hallocks are replaced twice, at a cost of thousands of dollars.

A 2-year USDA search for practical methods to eliminate this loss uncovered the usefulness of sodium orthophenyl phenate. This material is available either in commercial formulation or as a pure chemical.

Recommended procedure is to mix a low percentage (1.2) of the chemical in water, soak the bales of shook in this solution, and then proceed with making the hallocks. Soaking is usually the first step, anyway, because the wood must be wet when it is creased, bent, and stitched. Washing of the hallocks does not destroy the effectiveness of this treatment.

Researchers also tested the effects of wax, water-wax emulsions, and other fungicides in addition to sodium orthophenyl phenate.

Wax treatments, though effective, have several disadvantages. The

wax can't be applied to the water-immersed shook. And waxing one hundred thousand hallocks, worth a little over a penny each, is costly.

Cost of treatment with sodium orthophenyl phenate, however, is low. A few dollars will buy enough to treat a hundred thousand hallocks.

After a year's harvests of strawberries, raspberries, and blackberries, only 1 out of 6 untreated hallocks was still usable. Over 90 percent of the waxed hallocks and those treated with sodium orthophenyl phenate were usable. Other fungicides were effective in varying degrees, but sodium orthophenyl phenate was outstanding.

This work was done by ARS researchers J. E. Brekke, J. A. Sacklin, and E. R. Wolford, of the Puyallup (Wash.) station of the Western Utilization Research Branch, Albany, Calif.; Folke Johnson, Washington experiment station, Pullman.☆



Getting thrips off berries

■ THIRPS, THOSE troublesome little insects that infest raspberries, blackberries, and other cane berries, are due for extinction by drowning.

Commercial freezers and canners of cane berries easily remove the field debris and insects that come in on freshly picked fruits. Of course, all fruits are washed thoroughly.

But thrips are more difficult to get rid of. They are tiny enough to find refuge among the berry segments, and ordinary water doesn't wet the berries and thrips thoroughly enough to remove the insects. The fragile berries can take only gentle spraying and other mild washing methods—only moderately effective against thrips.

Thrips have another advantage in their contest with growers and proc-

essors. Winged forms migrate and may arrive in a berry field before or even during harvest. Thus, they sometimes escape field-control sprays. To save infested but undamaged berries, the thrips must be removed.

A safe, effective way to do this job has been developed cooperatively by the Puyallup (Wash.) station of USDA's Western Utilization Research Branch, Albany, Calif., and the Oregon experiment station, Corvallis.

Researchers demonstrated that dipping berries in a water bath containing less than 1 percent of a wetting agent conditions the thrips for effective removal. It wets them thoroughly and they slide into the wash water. An anionic type of agent such as alkyl aryl sulfonate was found to work

well; health authorities consider it suitable for use in washing fruits and vegetables if they are rinsed adequately. Berries are thoroughly washed and rinsed after treatment.

Researchers devised a tank with a belt device on the bottom, enabling berries to be dipped and removed mechanically and quickly. Using this device, they obtained data on absorption of water by berries, wetting-agent residue remaining on the fruit, and possible effect on preserves made from treated berries. Studies showed that the wetting agent had no effect on quality of fruit or preserves.

Researchers were J. E. Brekke, C. C. Nimmo, and H. A. Swenson, of ARS; C. E. Samuels, and J. R. Brock, of the Oregon experiment station.☆

OFFICIAL BUSINESS



**agrisearch
notes**

A NEW FEDERAL livestock and poultry disease laboratory will be constructed on a 318-acre tract of farmland near Ames, Iowa.

Location of this research facility close to the campus of Iowa State College was recommended by a special committee appointed by Secretary of Agriculture Ezra Taft Benson. Selection of the site was made after extensive hearings and visits to proposed locations in nine States.

The land has been purchased by the State of Iowa and is to be transferred without charge to USDA. Funds totalling \$16,250,000 have been appropriated for construction of the laboratory. Construction is expected to begin in the summer of 1957. ARS personnel will participate in planning and supervising construction, and will be responsible for handling research operations after completion.

The new facilities will provide for simultaneous research on a number of different diseases of livestock and poultry. Space and equipment will be available for testing and diagnostic work as well as for research.

TEN MINUTES or 25 to 30 cents worth of time spent in pruning off the lower branches of a young pine tree will allow it to develop clear, knot-free wood—wood that today is

retailing at a premium of as much as \$300 per thousand board-feet or \$15 to \$20 more per tree.

Knots form where lower ends of branches, dead or alive, have become part of a tree's main body. Cutting off lower branches while small allows the main trunk to develop clear wood.

Cooperative work by USDA's Forest Service and the Michigan experiment station at Kellogg Forest, Augusta, shows that pines at the 16-to 35-foot stage can be pruned 3 times at 4- to 5-year intervals in a total of about 10 minutes per tree. Such trees can be cleared of branches to half their height without retarding growth.

Foresters R. A. Ralston, of the Forest Service, and W. Lemmien, of the State station, point out that some grades of clear pine lumber are retailing today for over \$400 per thousand board feet. Lower grades with sound knots sell for less than \$100. Even if the pruning added only \$100 value per thousand and the pruning cost was compounded annually at 5 percent for the waiting period, pruning would still return \$10 per tree. Growers would get a share of it.

It will even pay to prune off the lower whorl or two of branches in 4- to 5-foot trees being grown for fence posts, pulpwood, or cabin logs.

SEED PRODUCERS may be able to reduce seed losses from shattering during harvest by 75 to 95 percent, if a new vacuum-cleaner-agitator device lives up to its promise. An experimental model attached to a

combine picked up enough crimson clover seed—ordinarily lost—to increase returns \$25 or more per acre.

Similar savings should be realized with hairy vetch and alta fescue seeds, which shatter at a high rate under ordinary harvesting methods. The machine may recover even more of some other crops, such as sub clover.

Developing the device are ARS and the Oregon experiment station.

EFFECTS OF high-energy radiation on cotton will be studied by Massachusetts Institute of Technology under a recent contract with USDA. Radiation will be generated electrically or by radioisotopes.

Researchers hope to discover if irradiation can make useful new textile products from cotton or increase its value as now used, thus improving the market position of this crop.

Several different phases will be studied. A determination will be made of the amount of radiation that cotton can absorb in fiber, yarn, and fabric form without degradation and loss of desirable properties such as strength, elasticity, resilience, and affinity for dyes. Whether or not irradiation aids or adversely affects subsequent chemical modification of cotton or the application of additive treatments will be studied. Effects of irradiation of cotton fabrics will also be investigated to learn if they can be made more durable by such treatment.

The contract was made through the ARS Southern Utilization Research Branch, New Orleans, La.